



## The toxicology of climate change: environmental contaminants in a warming world

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### Abstract:

Climate change induced by anthropogenic warming of the earth's atmosphere is a daunting problem. This review examines one of the consequences of climate change that has only recently attracted attention: namely, the effects of climate change on the environmental distribution and toxicity of chemical pollutants. A review was undertaken of the scientific literature (original research articles, reviews, government and intergovernmental reports) focusing on the interactions of toxicants with the environmental parameters, temperature, precipitation, and salinity, as altered by climate change. Three broad classes of chemical toxicants of global significance were the focus: air pollutants, persistent organic pollutants (POPs), including some organochlorine pesticides, and other classes of pesticides. Generally, increases in temperature will enhance the toxicity of contaminants and increase concentrations of tropospheric ozone regionally, but will also likely increase rates of chemical degradation. While further research is needed, climate change coupled with air pollutant exposures may have potentially serious adverse consequences for human health in urban and polluted regions. Climate change producing alterations in: food webs, lipid dynamics, ice and snow melt, and organic carbon cycling could result in increased POP levels in water, soil, and biota. There is also compelling evidence that increasing temperatures could be deleterious to pollutant-exposed wildlife. For example, elevated water temperatures may alter the biotransformation of contaminants to more bioactive metabolites and impair homeostasis. The complex interactions between climate change and pollutants may be particularly problematic for species living at the edge of their physiological tolerance range where acclimation capacity may be limited. In addition to temperature increases, regional precipitation patterns are projected to be altered with climate change. Regions subject to decreases in precipitation may experience enhanced volatilization of POPs and pesticides to the atmosphere. Reduced precipitation will also increase air pollution in urbanized regions resulting in negative health effects, which may be exacerbated by temperature increases. Regions subject to increased precipitation will have lower levels of air pollution, but will likely experience enhanced surface deposition of airborne POPs and increased run-off of pesticides. Moreover, increases in the intensity and frequency of storm events linked to climate change could lead to more severe episodes of chemical contamination of water bodies and surrounding watersheds. Changes in salinity may affect aquatic organisms as an independent stressor as well as by altering the bioavailability and in some instances increasing the toxicity of chemicals. A paramount issue will be to identify species and populations especially vulnerable to climate-pollutant interactions, in the context of the many other physical, chemical, and biological stressors that will be altered with climate change. Moreover, it will be important to predict tipping points that might trigger or accelerate synergistic interactions between climate change and contaminant exposures.

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## Resource Description

### Exposure :

weather or climate related pathway by which climate change affects health

Air Pollution, Ecosystem Changes, Extreme Weather Event, Food/Water Quality, Food/Water Quality, Precipitation, Temperature, Other Exposure

**Extreme Weather Event:** Other Extreme Event

**Extreme Weather Event (other):** Storms

**Food/Water Quality:** Chemical, Chemical, Chemical

**Temperature:** Extreme Heat

**Other Exposure:** Salinity

### Geographic Feature:

resource focuses on specific type of geography

None or Unspecified

### Geographic Location:

resource focuses on specific location

Global or Unspecified

### Health Impact:

specification of health effect or disease related to climate change exposure

Cardiovascular Effect, Infectious Disease, Injury, Respiratory Effect

**Infectious Disease:** Vectorborne Disease

**Respiratory Effect:** Upper Respiratory Allergy

**Population of Concern:** A focus of content

### Population of Concern:

populations at particular risk or vulnerability to climate change impacts

Children, Elderly, Low Socioeconomic Status

### Resource Type:

format or standard characteristic of resource

Review

### Timescale:

time period studied

Time Scale Unspecified